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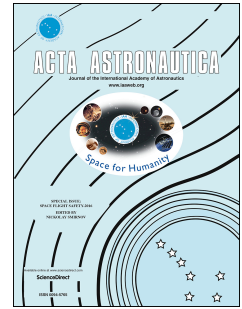
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# Visualization of the heat release zone of highly turbulent premixed jet flames

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**Abstract:** Visualization of the heat release zone (HRZ) of highly turbulent flames is significantly important to understand the interaction between turbulence and chemical reactions, which is the foundation to design and optimize engines. Simultaneous measurements of OH and CH<sub>2</sub>O using planar laser-induced fluorescence (PLIF) were performed to characterize the HRZ. A well-designed piloted premixed jet burner was employed to generate four turbulent premixed CH<sub>4</sub>/air jet flames, with different jet Reynolds numbers ( $Re_{jet}$ ) ranging from 4900 to 39200. The HRZ was visualized by both the gradient of OH and the pixel-by-pixel product of OH and CH<sub>2</sub>O. It is shown that turbulence has an increasing effect on the spatial structure of the flame front with an increasing height above the jet exit for the premixed jet flames, which results in the broadening of the HRZ and the increase of the wrinkling. The HRZ remains thin as the  $Re_{jet}$  increases, whereas the preheat zone is significantly broadened and thickened. This indicates that the smallest turbulent eddies could only be able to enter the flame front rather than the HRZ in the present flame conditions. The flame quenching is observed with  $Re_{jet}=39200$ , which may be due to the strong entrainment of the cold air from outside of the burned gas region.

**Keywords:** Turbulent flame, Heat release zone, OH PLIF, CH<sub>2</sub>O PLIF

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